

## REMARKS

In the February 23, 2003 Office Action, the Examiner noted that claims 1-9 were pending in the application; required correction of the drawings; objected to claim 5; rejected claims 1 and 4-9 under 35 U.S.C. § 102(e); and rejected claims 2 and 3 under 35 U.S.C. § 103(a). In rejecting the claims, U.S. Patents 6,539,142 to Lemoff et al.; and 6,445,844 to Neukermans et al. (References A and B, respectively) were cited. Claims 1-9 remain in the case. The Examiner's rejections are traversed below.

### The Invention

The present invention is directed to an optical switch which detects the frequency component of an additional signal superimposed on the application of a voltage of a mirror, and controls the application voltage of the mirror based on the detected frequency component.

### The Prior Art

#### **U.S. Patent 6,539,142 to Lemoff et al.**

The Lemoff et al. patent is directed to a system and method for aligning mirrors in a three-dimensional microelectromechanical systems (MEMS) optical switch using two-stage movable mirrors by actively adjusting the tilt of each mirror to minimize the loss of optical power. In the optical switch illustrated in Fig. 2 of Lemoff et al., the tilting of a mirror can be controlled by tapping part 34 of an optical signal to be switched. In the switch shown in Fig. 3, the tilting of a mirror can be controlled by directing, in a direction opposite to that of information-carrying optical signal 50, an alignment light beam 58 generated by emitter (LED) 54 with a wavelength different from that of the optical signal to be switched, back to the mirror and detecting the alignment beam reflected on the mirror (see column 5, line 59 to column 6, line 26). In both of these optical switches, a closed-loop feedback control circuit 38 or 64 is used in which a feedback signal is generated by dithering an alignment signal for controlling the tilting of the mirror using a prescribed frequency and by measuring the phase and amplitude shifts (column 6, lines 33-46).

#### **U.S. Patent 6,445,844 to Neukermans et al.**

The Neukermans et al. patent is directed to a flexible, modular and compact fiber optic switch which utilizes feedback control based on a signal from a distortion sensor attached to MEMS actuators. A "higher frequency servo system uses ... orientation signals produced by ...

torsion sensors 192a and 192b in controlling orientation of each mirror surface" (column 27, lines 35-37). In other words, control is performed by electric-mechanical response.

## Drawings

A Letter to the Examiner is being filed concurrently to submit the required drawing changes and corresponding formal drawings. The Examiner is respectfully requested to approve the drawing changes and enter the formal drawings.

## Objection to Claim 5

In the second paragraph of the Office Action, the Examiner objected to claim 5 because the limitation "the mirror" on lines 13 and 15 was unclear since both a "former-stage mirror" and a "latter-stage mirror" were previously recited. Claim 5 has been amended as suggested by the Examiner. Therefore, withdrawal of the objection is respectfully requested.

## Rejections under 35 U.S.C. § 102

On pages 2-4 of the Office Action, claims 1 and 4-9 were rejected under 35 U.S.C. § 102(e) as anticipated by Lemoff et al. As discussed above, Lemoff et al. discloses a closed-loop feedback control circuit that sends an alignment light beam in a direction opposite to the information carrying optical signal to generate a feedback signal by monitoring the alignment light beam that is reflected by mirrors. Furthermore, Lemoff et al. discloses that the detectors 34 (Fig. 2) and 62 (Fig. 3) detect optical signals, not an electrical alignment signal.

On the other hand, all of the independent claims now recite generating at least one "additional signal of a prescribed frequency" (e.g., claim 1, line 5), "superimposing the additional signal on the application voltage" (e.g., claim 1, lines 6-7), "detecting a signal component of the prescribed frequency which appears in light reflected on the mirror when the application voltage is applied to the mirror" (e.g., claim 1, lines 8-9), and then "controlling the application voltage based on the detected signal component" (e.g., claim 1, last two lines). Since the additional signal is superimposed on a voltage, the additional signal must be electrical. Nothing has been cited or found in Lemoff et al. of controlling a optical switch based on one or more oscillating electrical signals, as recited in the claims. Therefore, it is submitted that claims 1 and 4-9 patentably distinguish over Lemoff et al.

### **Rejections under 35 U.S.C. § 103**

On pages 4 and 5, claim 2 was rejected under 35 U.S.C. § 103(a) as unpatentable over Lemoff et al. Since claim 2 depends from claim 1 and there is no suggestions in Lemoff et al. of the control operations recited in claim 1, it is submitted that claim 2 patentably distinguishes over Lemoff et al.

On page 5 of the Office Action, claim 3 was rejected under 35 U.S.C. § 103(a) as unpatentable over Lemoff et al. in view of Neukermans et al. As discussed above, Neukermans et al. discloses the use of electromechanical response for control of a fiber optic switch. It should be clear from the description above that the present invention uses "electric-optical response" instead. Furthermore, nothing has been cited or found in Neukermans et al. regarding the control operations recited in claim 1, as discussed above. Since claim 3 depends from claim 1, it is submitted that claim 3 patentably distinguishes over the combination of Lemoff et al. and Neukermans et al.

### **Summary**

It is submitted that the references cited by the Examiner, taken individually or in combination, do not teach or suggest the features of the present claimed invention. Thus, it is submitted that claims 1-9 are in a condition suitable for allowance. Reconsideration of the claims and an early Notice of Allowance are earnestly solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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on 7/23/2003  
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By: 7/23/03  
Date 7/23/03